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United States Department of Agriculture,

DIVISION OF BOTANY.

NOTES ON THE PLANT PRODUCTS OF THE PHILIPPINE ISLANDS.¹

Of the area of the Philippine Islands, one-ninth, or about 3,267,000 hectares (over 8,000,000 acres), is devoted to agriculture. Taking into account the natural fertility of the soil and the vast portion of these rich lands not yet under cultivation, it can safely be assumed that with better methods of exploitation the total agricultural production of the islands could be increased to ten or fifteen times its present amount.

RICE.

One of the most important food products of the archipelago is rice. This grain forms the staple food not only of the native population, but also of the numerous Chinese inhabitants. Owing to its general use, a scarcity of rice always causes great hardship to the people of the islands.

The varieties of rice grown in the Philippines number more than a hundred, distinguished by the size, color, and flavor of their grains. The local names of the principal kinds are: *Quinamalig*, *quimalig*, *binatac*, *lamuyne*, *dinalong*, *quinastila*, *macapula*, *casobong*, *quiri-quiri*, *daliquit*, *sinampayan*, *quinanda*, *guinitan*, *calibo*, *macang-poti*, *mismis*, etc. The best of these is the *mismis*, a rice with a white, almost transparent grain of agreeable odor and flavor. There is also a variety, called *malagquit*, that has an unusually glutinous quality, and is therefore much used in the manufacture of cakes and pastry. Certain kinds of Philippine rice, the *quinamalig* among others, mature very early, producing a crop within three months from planting. It thus happens that by planting alternately an early and a late variety two crops can be obtained in one year.

¹Since the beginning of the Spanish-American war there has been an active popular demand for information on the plant resources of the Philippine Islands. In the absence of a specific appropriation for investigations in this line as a basis for a full and authoritative botanical report, Mr. Frank H. Hitchcock, Chief of the Section of Foreign Markets, whose work brings him into close relation with this subject, has prepared the accompanying manuscript and courteously placed it at the disposal of the Division of Botany. The main facts presented in these notes have been drawn from a report made by the French consul at Manila (M. de Bérard) to his Government and published in the "Bulletin Consulaire Français," Vol. XXII, part 6, 1891. The statistics of exportation are drawn chiefly from Mr. Hitchcock's recent report on the Trade of the Philippine Islands, published as Bulletin No. 14 of the Section of Foreign Markets.—FREDERICK V. COVILLE, *Botanist*.

The ordinary price of rice in the husk, called by the Filipinos *palay*, is 13 to 14 reales fuertes per cavan of 75 liters (about 60 to 65 cents per bushel), while that of shelled rice is from 20 to 22 reales fuertes per cavan (about 90 cents to \$1 per bushel).

The annual production of rice in the Philippines averages about 17,000,000 cavans (36,000,000 bushels). This amount, even when supplemented by maize, *mongo* (a kind of lentil), sweet potatoes, bananas, and other edible fruits and tubers, is far below the actual food requirements of the population. It seems singular that an almost exclusively agricultural country should not produce enough food for the consumption of its own inhabitants, but such is at present the case as regards the Philippines. In order to supply the home demand, it has been the custom to draw upon the product of other rice-growing countries. The French colony of Cochin-China, on account of its proximity to the islands, is the principal source of supply. In some years the quantity of rice imported into Manila from Saigon has exceeded 1,500,000 cavans (about 3,200,000 bushels), the value reaching 2,500,000 pesos (nearly \$2,000,000). The Philippine trade is therefore a source of large income to the rice planters of Cochin-China.

MAIZE.

In several provinces of the Philippines, as for example in Cayagan and La Isabela on the island of Luzon, the inhabitants subsist chiefly on maize (Indian corn), which is grown together with tobacco. As a rule, maize is not consumed so largely in other parts of the archipelago, although in years when the rice crop has been deficient this grain has formed an indispensable supplement to the dietary of the native population.

Several kinds of maize are grown. The early varieties are generally preferred, because their use permits the harvesting of two crops in one year. The quantity of maize annually produced may be set down at about 2,000,000 cavans (about 4,250,000 bushels). It is sold at from 4 to 5 reales fuertes per cavan (about 18 to 23 cents per bushel) of shelled grain.

VEGETABLES.

Among the varieties of pulse cultivated, there are several species used as food by the natives that never appear on the tables of the European settlers. There is first the *mongo*, which resembles a lentil; then come several kinds of beans, such as the *butingue*, the *zabache*, the Abra bean, and the Patami bean. These suit the natives much better than the "garbanzos" (chick-peas) that are so highly prized by the Spaniards.

Tuberous roots also constitute a valuable source of food. Among these the sweet potato occupies first rank, with an annual production of about 700,000 piculs (98,000,000 pounds). The common or

white potato, although of a rather inferior quality, comes next in importance. Then follows the *camoteng-cahoy* or *manihot* (cassava), the root of which is made edible by the removal of its poisonous juice after the same manner as in the West Indies. When the juice has been pressed out, the pulp forms a sort of coarse-grained flour that is very nutritious, pleasant to the taste, and easy to digest.

Besides the three tubers just mentioned, numerous other plants are cultivated in the fields of these islands for the sake of their edible roots, among them being the *ubi*, the *togui*, and the *gabi*.

Other edible vegetables that occur are the following: Calabashes, melons, watermelons, cucumbers, carrots, celery, parsley, tomatoes, egg-plants, peppers, including the very piquant chile pepper, capers, cabbages, lettuce, endives, mustard, leek, onions, asparagus, peas, and even strawberries, the last-mentioned, however, at only a few points in the districts of Abra and of Benguet.

FRUITS.

Fruits grow in great abundance, and the reputation of some of them is established even abroad. This is true of the mango, for example, which is the best representative of its class. Other fruits of the islands are the *ate* (the cinnamon apple of the French colonies), the mangosteen (found only in the Sulu Islands and the southern part of Mindanao), the pineapple, the tamarind, the orange, the lemon, the jack, the jujube, the litchi (the king of fruits according to the Chinese), the plum, the *chico-mamey* (the sapodilla of the West Indies), the breadfruit, and the papaw. The papaw is eaten like a melon, and is said to act as an efficacious digestive. The juice of this fruit furnishes an extract that is used as a medicament under the name of papaine, or vegetable pepsin.

The banana grows abundantly in the Philippines. This fruit is a great boon to the poor people, supplying them at little cost with a delicious and exceedingly nutritious article of food. There are numerous varieties, but the most highly esteemed are the following: The *saguing*, the *bongulau*, the *lacatan*, the *obispo*, the *tonduc*, the *gloria*, the *letondol*, the *pepita*, the *morado*, and the *saba*.

SUGAR CANE AND SUGAR MAKING.

The Philippine plants that are cultivated for industrial purposes are quite numerous. Among sacchariferous plants cane is the only one that is at present employed for the manufacture of sugar. A species of sorghum called *bataad* is grown, but it does not appear to be used for sugar making. Four varieties of sugar cane are cultivated, as follows: Yellow cane, Otaheite cane, purple cane (Batavia cane), and striped cane.

Owing to crude methods of manufacture, the sugar made in the Philippines is inferior in quality and consequently brings a low price. The product consists chiefly of raw sugar that is anything but attractive in appearance. It has a russet color, resulting, it is said, from the use of lime in the process of preparation. Comparatively little refining is done. In 1891 there was only one refinery in operation. It was situated at Malabon, near Manila, and was owned by an English company.

Of the total amount of sugar produced in the Philippines, only a small part is consumed in the islands. During the last few years the shipments to foreign markets have averaged over 3,500,000 piculs (about 500,000,000 pounds) a year, exceeding in importance all other exports except those of Manila hemp.

Philippine sugar finds its principal markets in the United States, the United Kingdom, China and Japan, and Spain.

FIBERS.

Manila hemp.—By far the most important of the fiber plants growing in the Philippines is Manila hemp or *abacá*. At first sight this plant might be taken for an ordinary plantain or banana tree, but its fruit is much smaller than the banana, and is not edible.

The Manila hemp crop comes chiefly from the provinces of Albay and Camarines on the island of Luzon, and from the islands of Marinduque, Leyte, Cebu, Mindoro, Samar, Mindanao, and the southern part of Negros.

The finest quality of the fiber is called *lupis* or *quilot*, and is of a pearly lustre. Other grades are distinguished by their color and consistency.

Nearly the entire crop is marketed abroad. The average yearly shipments amount to nearly 100,000 long tons and form the most important item in the Philippine export trade.

The United Kingdom and the United States receive the largest shipments, although considerable quantities are also sent to Spain, Australasia, China, and Japan.

Cotton and other fiber plants.—Cotton occupies a peculiar position in the Philippines. It was the first raw fiber used locally in the manufacture of textile fabrics, but it has recently lost much of its former importance, partly because of the excessive taxation that has for some time been imposed on the textile industry of the islands, but principally because of the competition of British fabrics.

The cotton plants cultivated in the Philippines are chiefly of the herbaceous varieties. They yield a fine white staple, of superior quality and strength. One variety, however, known under the name of *cayote*, produces a cinnamon-colored fiber. There is also a species called *bubuy*, that grows like a shrub. The fiber it produces

can not be employed in weaving, but is used for stuffing mattresses, pillows, cushions, etc.

Another textile plant that occurs is the *amiray*. This plant is found only on the Batanes Islands north of Luzon. It closely resembles ramie and yields a fine white fiber of great tensile strength.

Various other fiber plants are found in the Philippines, such as the *pita* (a kind of aloe), the *balibago*, the *dalanot*, or tree-nettle, the pineapple, and the *cabonegro* (a species of palm tree), as well as many other varieties more or less unknown outside of the archipelago.

INDIGO AND OTHER DYE PLANTS.

Years ago indigo was one of the important products of the islands. In quality the Philippine article compared favorably with the best grade of the Guatemalan product. It used to bring from 80 to 85 pesos per quintal (61 to 65 cents per pound), but in 1875 the price fell to 30 pesos per quintal (23 cents per pound). At present it fluctuates between 40 and 45 pesos per quintal (30 and 35 cents per pound).

The decline in prices was brought about by a deterioration in quality that resulted in a greatly lessened demand. The cause of this deterioration in quality is easily explained. Years ago the native grower knew and practiced only the most primitive methods of preparing indigo; but with the arrival of large numbers of Chinese in the Philippines, he gradually abandoned the original processes and began to imitate the Chinese practice of adulteration. It was found that by the admixture of a small quantity of lime with the indigo, the coloring matter could be precipitated and the product prepared for the market in a much shorter period. While the more rapid process proved a source of temporary profit, the effect upon the quality of indigo was soon discovered by the purchaser and the Philippine product, owing to the extensive use of lime, fell into discredit in foreign markets. If the practice of intermixing lime should be abandoned and a pure grade of indigo again produced, higher prices would, undoubtedly, be restored.

Indigo is produced in the provinces of Bulacan, Nueva-Ecija, North Ilocos, South Ilocos, Pangasinan, La Laguna, Batangas, Tayabas, Capiz, Bohol, also in several other provinces. The best kind is said to grow in the vicinity of Bayambang in the province of Pangasinan. Most of the indigo exported from the islands goes to China; shipments are also sent to Europe and to the United States.

Other Philippine dye plants that should be mentioned are the *sibucao*, or sapan wood, the *biri*, or safflower, the *achuete*, used as a substitute for saffron, and the *quillite*, furnishing a red color.

OIL-SEEDS.

Oleiferous plants occur in considerable numbers. Besides the cocoa-palm, there are the *mani*, or peanut, the *lumbang*, or candle-

nut, the *ajonjoli*, or sesame, the *tangan-tangan*, or castor-bean, and the *bayang-cambling*. The oil from the last mentioned does not become rancid and is, therefore, employed in perfumery for the preservation of essences.

CACAO.

Numerous other plants grow spontaneously in different parts of the Philippines. Their uses have been determined only so far as the natives have discovered their various qualities. The cacao tree is found, but not in great numbers. It is not so abundant in the islands of Luzon and the Visayas as it is in some other parts of the archipelago. The district of Davao furnishes the best quality. The total quantity of cacao produced does not amount to more than 2,000 piculs (280,000 pounds). It is consumed at home in the manufacture of a very poor grade of chocolate.

COFFEE.

Coffee is grown successfully in the Philippine archipelago, but the plantations are not nearly so well managed as they might be. Great improvements could be made in the culture of this tree on the plantations in the provinces of La Laguna, Tayabas, and especially Batangas, which is the center of production.

The coffee grown in the Philippines resembles that of Java and of Martinique in flavor. Some enthusiasts even go so far as to claim that it is as good as the finest Mocha. The fact is that when properly selected, roasted, and strained, the coffee drunk at Manila is often exquisite. As a general rule, Philippine coffee is not of the best quality. It could undoubtedly be improved by careful selection.

The annual coffee crop of the Philippines formerly amounted to about 100,000 piculs (14,000,000 pounds), valued at 2,000,000 pesos (\$1,600,000), but in recent years the production has been much reduced by the ravages of an insect that destroys the trees. A large part of the coffee raised in the islands is exported to Spain.

THE COCOA-PALM AND ITS PRODUCTS.

There are several species of cocoa-palms growing in the archipelago, but the ordinary cocoanut-tree (*Cocos nucifera*) is the most important. The Indians make use of it in a great many ways, but only the principal ones need be enumerated. The kernel of the nut they use for food, while the liquid the shell contains makes a refreshing drink. If allowed to stand for some time, this liquid forms a very agreeable milky juice that is relished not only by the natives but by Europeans as well. After this juice has coagulated, it is mixed with sugar and made into bonbons, known as cocoa sugar, and also into various other delicacies. By tapping the central bud that crowns the cocoanut-tree, a kind of wine, called *tuba*, of an agreeably pungent taste, is produced. This *tuba*,

when allowed to ferment, produces vinegar, and when distilled, a kind of brandy, that is highly relished by the natives. From the husk of the cocoanut the Tagals make ropes and cords, and a material for calking their boats. From the woody shell they carve spoons, cups, beads for rosaries, and many other articles. The leaves they use to cover the roofs of their houses. Roofs made in this manner are thick and tight, but they have the disadvantage of burning readily, so that in the towns and villages where the houses are thus covered conflagrations spread with great rapidity. The veins and smaller ribs of the leaves are used to make brooms, the midribs serve as fuel, and the ashes are utilized in making soap. The trunk of the palm is made to serve as a pillar to support the houses that its leaves overshadow. Oil barrels, *tuba* casks, and water pipes are fashioned from hollow sections of the trunk. From the roots the natives extract a red dyeing material that they chew in place of the Areca palm nuts or *bonga* when the latter can not be procured.

Large quantities of cocoanut-oil are manufactured in the Philippines. This oil is much prized by the natives. The men and the women both use it to anoint the thick growth of hair that adorns their heads, and it thus finds a ready sale at remunerative prices. It is also used in the lamps that take the place of gas burners on the streets, and in those used by the natives and Chinese in their houses.

Manila exports annually about 150,000 pesos (\$120,000) worth of cocoanuts to China and British India, and about 30,000 pesos (\$23,000) worth of cocoanut-oil to China.

THE BAMBOO.

After the cocoa-palm, with its manifold uses, should be mentioned the bamboo. This tropical plant grows in many different localities, but the more elevated regions supply the hardest and most durable wood. The young and tender shoots of the bamboo make a very acceptable article of food. They are eaten in the form of salads, sauces, and other dishes. In years of long-continued drought they even take the place of rice to a considerable extent.

When the branches of the bamboo are from three to four months old, they are in the proper stage to be used in the manufacture of hats, baskets, harnesses for buffaloes, etc. Later on, when it has reached its full growth, the fiber is employed for making well-ropes and other cords to be used in water. Ropes made from this fiber are said to withstand moisture for a long period.

TOBACCO AND CIGARS.

Tobacco grows to some extent in most of the islands of the archipelago. Cultivation is carried on to best advantage on the low grounds that are periodically fertilized by the overflowing of the

rivers. On the highlands beyond the reach of the floods the yield is much smaller. Tobacco is generally cultivated in the same field with maize.

The best quality of Philippine tobacco is said to grow in the province of La Isabela, and particularly in the lowlands that surround some of the villages situated to the south of Ilagan, such as Gamu, Echagüe, and Angadanan. Varieties that occur in the province of La Isabela and also in that of Cagayon are the *saber* ("de l' épée"), American, *darolu*, and Sumatra. In Nueva-Ecija there is a tobacco of an unusually strong and bitter variety, called *gapan*, that is much prized by the natives. In Ilocos, La Union, Abra, and Lepanto, a kind of tobacco known by the name of *igorrotes* is produced. This variety dries out to a large extent while it is being smoked, and consequently has a rather disagreeable flavor. On the Visayas Islands, and especially about Iloilo and Cebu, still other kinds are grown, the most highly esteemed being that of Barili.

Over 100,000,000 of cigars are exported annually from Manila. They are sent chiefly to China and Japan, the East Indies, the United Kingdom, Spain, and Australasia. The shipments of leaf tobacco average about 200,000 quintals (20,400,000 pounds). They find their principal market in Spain.

SPICES, AND MEDICINAL AND ORNAMENTAL PLANTS.

Of spices, the Philippines furnish cinnamon, nutmegs, pepper, ginger, and marjoram.

Medicinal plants are abundant, but most of them are little known. Among the most familiar are the papaw, which has already been mentioned among the fruits. Several kinds of ipecacuanha occur, and also the *dita* (*Alstonia scholaris*), a kind of cinchona, from the bark of which ditaïne is obtained, and the *parsonia*, whose stems boiled in cocoanut oil form a balsam used for healing wounds.

Aromatic and ornamental plants are not wanting in the Philippine Islands, but as they grow wild in such profusion no care is bestowed upon them. Among such plants may be mentioned magnolias, camellias, clematis, several kinds of roses, dahlias, the ylang-ylang, from which a sweet perfume oil is extracted, the papua, the jessamine, and many species of ferns and orchids.

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Approved :

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